stay inside the appendix or it may perforate through it and spread.
The first symptom of appendicitis is always pain--pain not near the appendix but in the pit of the stomach; thence it goes to the region of the navel; and thence to the appendix region. The next symptom is nausea, followed by vomiting. The next is fever.
Treatment of appendicitis: Acute appendicitis is still a dangerous condition, and many surgeons believe it is best to let the patient get over the acute attack before operating. In handling an acute attack, this definite knowledge is necessary: "do nothing"; especially do not give a cathartic or purgative. This simple advice is not always easy to heed, for there is the household doctor who will prescribe a dose of salts or castor oil when a member of the family has a pain in the abdominal region. Yet no amateur doctor can tell whether a given case of abdominal cramps is serious or not. In an attack of acute appendicitis no food should be taken and no water (except in very small sips), the object being--as above--to prevent any intestinal movements around the inflamed appendix and the consequent spread of infection.
The complex nature of food: Six kinds of chemical ingredients may be distinguished in our foodstuffs:
(1) carbohydrates (or starches and sugars)--exemplified by sugar, which is pure carbohydrates; by most vegetables and fruits, although these contain all the other food principles; by a large part of bread and other grains, such as oatmeal, cornmeal, and rice; and by milk. A form of carbohydrate is cellulose, a colorless, transparent solid, insoluble in water, alcohol, etc., (but soluble in sulphuric acid) that is not digested in the body, yet is necessary in the diet because it gives bulk to food and helps to prevent constipation. Most vegetables are a prolific source of cellulose.
(2) proteins--represented by egg-white, which is pure protein; and by meats, fish, game, and oysters. There are also vegetable proteins, of which peas and beans contain a high proportion. Proteins are also present in nuts.
(3) fats--represented by butter, as the pure example of fat in daily use; by the fat part of meats, by cream; by the fat in nuts; and, to a small extent, by nearly all vegetables, particularly asparagus. There is no difference between fats and oils, except that at ordinary temperatures fats are solid and oils are liquid; for use as food they are the same.
(4) water--contained in all food substances, combined or free. Some vegetables contain as high as 90%: potatoes are more than 80% water. Milk contains 87%; eggs 65%; and meats about 50%.
(5) minerals (inorganic salts)--those that are necessary to the body include: calcium, magnesium, sodium, potassium, chlorine, phosphorus, sulphur, and iodine. Any average diet will have them. Calcium is a constituent of the bones; sodium, potassium, and the iron salts find their way into the blood. Some of these minerals we get in water, and others in other kinds of food. Vegetables, for instance, have a special diet value, because of the large amounts of lime, potassium, and other minerals that they furnish in the body.
(6) vitamins--found in cream, butter, egg-yolk, cod-liver oil, yeast, milk, orange-juice, tomatoes, potatoes, lemon-and-lime-juice, and green vegetables. The lack of some vitamins prevents growth, and lowers the resistance to certain disease germs (vitamin A); makes it impossible for the body to use the lime supplied it, so that no mineral matter is deposited in the bones and the teeth (vitamin D); causes scurvy (vitamin C); causes a loss of appetite and a certain disease of the nervous system (vitamin B).
Note: Each of these six principles has a different fate after entering the body. In general it may be said that carbohydrates are used entirely for fuel (energy); proteins for tissue replacement or repair; and fats sometimes

for fuel and sometimes for tissue, i.e. they are really storage energy, used when the body needs fuel and no food is available...However, they all share in heat production.
Parts of the body responsible for the digestion of these different kinds of food: In the mouth, the saliva has a solvent action upon the starches; upon the fats and proteins it has very little effect except to render them softer and better prepared for the action of the other digestive juices. In the stomach, the gastric juice acts upon the proteins. In the small intestine, the food is attacked by the juices from the pancreas and the liver as well as by the intestinal juice itself; the pancreatic juice has the power of acting upon all the foodstuffs (proteins, starches, and fats); the juice of the liver, or bile, acts mostly on fats, assisting in the absorption of fats. By the time the contents of the small intestine reach the large intestine they are mostly deprived of their nutritious constituents; still, the chief work of the large intestine is absorption, especially the withdrawal of water, and the leaving of a solid mass of waste matters, ready for ejection from the body, and called feces.
Daily Diet: judging from the above list of foods and their uses, the daily diet of an average adult should include: (1) a pint of milk (as beverage, soup, etc.); (2) fruit, preferably fresh; (3) vegetables, two every day, one raw if possible; non-starch ones, such as spinach, cabbage, beets, carrots, lettuce to be preferred; (4) eggs--one every day, or at least three a week; (5) meats, or a meat substitute. For those in sedentary occupations,meat once a day is sufficient, as the by-products formed in the body throw an undue tax on the excretory system; (6) bread and cereals; preferably the whole grains; and (7) water--at least 4 to 6 glasses.
Once a balance diet is secured--and the appetite is a fairly good criterion, a few simple rules should be observed in eating the food: (1) eat only at meal times; (2) eat a reasonable amount at each meal; (3) eat a variety of foodstuffs; (4) eat slowly and chew well; (5) be pleasant at meal times; (6) drink plenty of water in between meals.
Note: Do not hesitate to modify this diet when occasion demands it: e.g. make allowance for the extra expenditure of energy involved in a spell of unusually hard work; on the other hand, should a sprained ankle curtail your activities for a while, reduce your food supply to conform with the decreased needs of your body.
To reduce in weight: Eat plenty of vegetables, fruit and salads, which are bulky, but of a low heat producing value. Avoid starchy foods, fats, and sugars. Take plenty of water. Exercise in the open air as much as possible.
To gain in weight: Increase the starchy foods and fats, in addition to what is given under the adults' daily diet (above). Sleep and rest as much as possible.

The Excretory System.

We have spoken of digestion, of absorption, and of nutrition or the utilization by the tissues of food and air. We have seen that nutrition is a kind of combustion or burning, and that certain waste products result. The most constant of these is water; the next most constantly formed is carbon dioxide; then, of course, the non-digestible residue of food must be got rid of; and, last but not the least, certain salts and urea.

The non-digestible residue of food or feces, as was said before, leaves the body by the bowels; the remaining waste matters are discharged either by the skin, the kidneys, or the lungs. We have already discussed the skin as an excretory organ; the lungs we shall examine under the Respiratory System; for the present we shall consider the kidneys and the part they play

in excreting the waste products.
The Kidneys: two tubular glands, placed at the back of the abdominal cavity, one on each side of the spinal column, and each supplied with a tube or duct--the ureter--which conduct their secretion to the bladder, whence it escapes to the outside by a short canal, the urethra. They discharge practically all the urea, the greater portion of the salts, a large amount of water, and a very small quantity of carbon dioxide. The process of urine secretion goes on constantly, at the rate of about a drop every thirty seconds from each kidney, but may be increased by various agents (e.g. such diuretics as coffee and tea).
Although examination of the urine for kidney disease is a method used since the earliest times, nothing approaching a scientific test was had until chemistry attained something like maturity. The kidneys, naturally, are subject to several diseases, including the fairly common condition of "stone in the kidney", but it is a mistake to blame them in the case of diabetes--a disorder of sugar and starch nutrition.

The Vascular or Blood System.

In listing the different kinds of tissue we said that blood is a true tissue consisting of two different types of cells, the white and the red, swimming in a liquid medium, the serum. This ability of the blood to swim, or rather to move, is prerequisite to its function of acting as the transportation agency in the body. Another peculiarity the blood has as a tissue is that its most numerous and important cells, the red cells (or corpuscles) are without nuclei. Still another necessary feature of the blood is its ability to solidify or coagulate when it reaches air. If it did not have this feature, the smallest cut in a blood-vessel would shortly drain every drop of blood from the body. In the average man, the weight of the blood amounts to about 12 pounds.
The red corpuscles, which resemble tiny disks under the microscope, are largely made up of iron in the form of hemoglobin, which, in combination with oxygen, gives them their particular colour. Their function is to carry oxygen from the lungs to the tissues, and carbon dioxide from the tissues to the lungs.
The white corpuscles, few in number in comparison with the red, are of various forms, but none of them have limiting membrances or cell-walls, although the protoplasm of which they are composed contains a nucleus, and sometimes two or even three nuclei. They possess the power of spontaneous movement and are capable of changing their form and place. This factor allows them to creep around bacteria, envelop them with their own substance, and finally kill them. Their function, then, is that of a protective agent, although they also assist in the coagulation of the blood.

It should be noted that blood is not the only fluid transporting material to different parts of the body. The lymph, which is a form of blood serum, and is derived from it, bathes all the bodily tissues, acting, to change the figure, as a middleman between the blood-vessels and the cells. Along the course of the lymph stream are small seed-like enlargements, the lymph nodes, which take an active part in the destruction of infection around a given part, and are always found enlarged in the region of an infection. For instance, a particularly rich supply of lymph nodes exists in the neck and under the jaw, and if there is an infection of the tonsils, or an abcess in the teeth, these neck or jaw glands enlarge.

Because the cells of the body are so numerous and so compactly placed, a circulatory system of blood is absolutely essential for life. The organs concerned in the circulation of the blood are the heart, the arteries, the

capillaries, and the veins.
The heart is a thick-walled muscular organ containing four cavities, two on either side of a central partition, the upper two referred to as the right and left auricles, the lower two, as the right and left ventricles. The action of the heart is not unlike that of a pump; in fact, due to the presence of the central partition, it is not unlike that of two separate pumps. At any rate, it is so constructed and so furnished with valves, that at each contraction of its muscular fibres it drives a certain quantity of blood from the ventricles into the arteries, receiving during the interval between that stroke and the next, the same quantity of blood from the veins. These contractions are rhythmical, i.e. they occur in a certain order: first there is a simultaneous contraction of the walls of both auricles; immediately following this a simultaneous contraction of both ventricles; then comes a pause or a period of rest, when the cycle is repeated. Technically, the state of contraction is called the systole; of dilation, or rest, the diastole. In an average adult the heart contracts at the rate of 70 to 80 times a minute, but the rate increases as the position is changed from the lying to the sitting, and, still more, to the standing; hence the importance of considering a person's position in cases of bleeding.

At every contraction of the left ventricle blood is forced into the arteries (which have a large amount of elastic tissue in their walls), causing them to dilate, and producing a regular expansion known as the pulse, which corresponds to the beat of the heart, and may be felt wherever the finger can be placed on an artery as it lies superficially over a bone.

In the general or systemic circulation, the purified bright red blood in the left ventricle is driven into the main artery of the body, the aorta; from the aorta, branch arteries are given off to all parts of the body, the blood being propelled forward by the force of the contractions of the heart and by the recoil of the elastic walls of the arteries, which have been dilated by the blood at each beat of the heart. These arteries divide and sub-divide, becoming smaller and smaller, and terminate in very thin walled vessels, the capillaries. It is through these capillaries that the interchange of gases and fluids takes place: the blood gives off oxygen and nourishment to the tissues, and takes up from them carbon dioxide and waste matters. The presence of these impurities changes the colour of the blood from bright to dark red. The capillaries unite to form small veins, and these join with other veins, becoming larger and larger, until they have all united to form two large veins--the vena cavae--which enter the right auricle of the heart. The blood is helped onwards in the veins by the suction action of the heart, and is prevented from flowing backwards by a series of valves in the veins.

The pulmonary (pertaining to the lungs) circulation transports the venal blood from the right auricle through the pulmonary artery, which branches to each lung. Each branch again divides into capillaries in the lungs so that the blood comes into contact with the air. Here the blood gives off its carbon dioxide and impurities and takes up oxygen, thus becoming purified and bright red in colour. The capillaries unite to form the pulmonary veins which convey the oxygenated arterial blood to the left auricle, whence it passes to the left ventricle, and so completes the round of circulation. This cycle is continuous, occurring once in about every 22 seconds.

Lying enclosed in its double membranous sac called the pericardium, with its fluid which tends to minimize any surface friction on the organ (cf. the pleurae of the lungs), the heart is by far the hardest worked muscle in the body. It is especially hard worked at that period of life when growth

is very rapid, and extra strain put upon it at this time is liable to cause trouble. The heart also becomes weak in old age, and old persons should take care not to overwork their heart. But in the average man or woman exercise strengthens the heart, and, despite some people's belief in the "athletic heart" theory, other parts of the body will become strained before the heart gives way, providing, of course, the heart is in a normal condition. There is danger, however, if the athlete has a cold. Hence the treatment for a cold is rest, and not a strenuous gym. workout. The most common of all causes of damage to the heart is the growth of disease germs in it. Many cases of heart infection are associated with rheumatism, the germs growing in the heart muscle as well as in the other muscles. In other cases, germs from diseased tonsils or from infections at the roots of the teeth float away in the blood, and, on reaching the heart, set up their growth there. Sometimes the heart is attacked in scarlet fever; often it is greatly weakened in diphtheria. To prevent these injuries to the heart, diseased tonsils should be removed, the teeth should be kept sound, and every effort made to check infection leading to scarlet fever and diphtheria.

Fainting is due to sudden failure of the action of the heart; the cause is heart weakness which may be aggravated by fatigue, tight clothing, a stuffy room, or mental stress. See your First Aid book for treatment in cases of fainting; also for treatment of haemorrhage. Remember that in treating wounds there are three objects: (1) to stop the bleeding; (2) to lessen the effects of shock; and (3) to prevent infection or sepsis.

The Respiratory System.

Bring a mirror close to your mouth and breathe upon it. There will, as you know, be a film of moisture deposited. Take a rubber bulb from an atomizer and blow the air from it upon the mirror; there will be no moisture. This is the whole secret of the physiology of respiration: the air you breathe out is different from the air you breathe in. It has more water, for one thing, as you discovered with the mirror test. What you cannot see is that it has more carbon dioxide and less oxygen.

It took men a long time to stumble upon this fact. Inquiring minds had been puzzling about the problem for at least 2,000 years before Lavoisier discovered the explanation in 1777.

We have previously described the body as a machine for the production of energy. In a heat machine or a combustion machine, which is what the body is, oxygen is absolutely essential for every flame consists of the union of oxygen with other elements. Light a candle, put it under a glass, and you will soon see that its flame cannot burn without oxygen.

Spoiled food and unclean water we can refuse, but the air that comes to us we must breathe, be it clear or smoky, pure or dust-laden. Cato, a Roman philosopher, once said that he could kill himself at any time by holding his breath. Cato probably knew much more about philosophy than about physiology....1000 times an hour, on an average, we take in a fresh supply into the lungs, and each time about 30 cubic inches of air. It should be obvious, then, that no building should be built without providing some way of giving the people who must live and work in it a supply of fresh, life-giving air.

In most aquatic animals the respiratory organs are external in the form of gills. In land or air-breathing animals the respiratory organs are situated internally in the form of lungs and are placed in communication with the outer air by a tube or windpipe.

The act of respiration consists, essentially, in having the air brought to

a place where there is a very thin membrane between it and blood; the oxygen in the air passes through the membrane and cells, to be carried by them to the tissues. The blood cells, in the meantime, have been carrying the by-products of combustion, carbon dioxide and water, which now separate from the blood cells, pass through the membrane, are given off into the lungs, and are breathed out in expiration.

The windpipe or trachea, and its divisions, the bronchi (or bronchial tubes), are surrounded and held open by heavy rings of cartilage in order that no muscular action or crushing of external objects can compress that absolutely necessary pipe line. Each bronchus divides and subdivides until it gets to its ultimate point, the thin-walled alveolus or air sac of the lung. There are millions of alveoli, individual little lungs, each exactly like the other, in each lung. In the thin, delicate walls of the alveoli are great numbers of fine blood capillaries in which the exchange of gases takes place (see the Vascular System).

Each lung is enveloped in fine membranes, the pleurae, one layer adhering to the lung surface and the other to the inner surface of the chest wall. A yellowish fluid is secreted by these membranes, thereby allowing the lung to move freely within the chest during respiration.

In inspiration, which is chiefly a muscular act, the ribs and the sternum are lifted up and out, widening the cavity of the chest, while the diaphragm is drawn downward, causing the bottom of the cavity to sink and increase its size further. The chest walls and diaphragm are thus drawn away from the lungs, leaving a vacuum between the two layers of the pleurae; but so promptly do the lungs expand and follow up the chest walls and diaphragm in inspiration, that there is no noticeable space between the two layers of the pleurae.

In ordinary expiration the muscles do little work, the ribs and the sternum skiking chiefly from their own weight, and the diaphragm being pushed up by the abdominal organs below it. This action, and the elasticity of the lungs drives out the air. For just as the stretched walls of a blown-up balloon expel the air, so the stretched walls of the air sacs and of the small bronchial tubes help to force the air out of the lungs.

To allow pure air only to reach the lungs, the trachea is lined with cells which manufacture a sticky mucus in which dust and germs from the air are caught, as well as with minute hair-like cilia, whose incessant movements sweep this dirt-laden mucus upwards and outwards.

Under normal conditions breathing should take place through the nose only, as the nasal passages are not only narrow and thickly lined with a mucous membrane, but are freely supplied with blood-vessels and can therefore, even in the coldest weather, warm the air before it reaches the lungs, and thus prevent any undue cooling or shock to the lung tissue.

Out of the nasal passages the inspired air passes into the pharynx, a funnel-shaped cavity lying behind the mouth. Hanging down in front of the openings from the nasal chambers, and helping to separate the mouth from the pharynx, is the little curtain-like structure, called the uvula or soft palate.

In swallowing, the uvula is pushed back over the openings from the nose, covering them and preventing food and water from entering the nose.

At the bottom of the pharynx are two openings, one leading into the esophagus or gullet, and the other into the larynx or voice box, at the head of the trachea. In front of and above the opening to the larynx is a flap-like structure called the epiglottis, which when swallowing occurs, prevents the entry of solids or fluids into the larynx as the larynx moves up to it.

During breathing, of course, the larynx drops down, allowing air to pass unimpeded into the trachea. In cases of insensibility, the epiglottis may fail to act, so that, should solids or fluids be given by the mouth, they may

enter the trachea and cause choking. Another danger is that the tongue of an insensible person is very apt to fall back on the epiglottis and so obstruct the windpipe.
Hygiene of the respiratory system: (1) Re: keeping away from respiratory diseases. Of all classes of infectious diseases we have made least progress in the prevention of respiratory diseases, and it is simple wisdom to expose oneself as little as possible to infection with colds, influenza, pneumonia, and tuberculosis. (2) Re: the danger of breathing dust. Dust particles cut and wound the air passages, allowing germs of many respiratory diseases to enter the tissues at these points and to set up their growth there. (3) Re: the value of deep breathing exercises. If filled to their utmost, the lungs contain about 325 cubic inches of air in the average man, only about 30 cu. ins. passing in and out in an ordinary breath (tidal air). Yet, in addition to the tidal air one can expel about 100 cu. ins. of air from the lungs in a forced expiration, this amount being known as reserve air. Similarly, one can take in about 100 cu. ins. in addition to the tidal air in a forced inspiration (complementary air). And even there remains about 100 cu. ins. of residual air after a forced expiration. From these figures and facts, the importance of deep breathing exercises should be readily seen, and outdoors--in the fresh air--is the best place to take them. Note: walking and running (especially the latter) are considered fine deep breathing exercises.
Some modern means of examining the lungs to determine the presence and nature of disease: (1) Percussion--striking the body with short, sharp blows as an aid in diagnosing the condition of the parts beneath by the sound obtained. (Discovered by Auenbrugger, an Austrian, in 1761)
(2) Auscultation--listening (with the aid of a stethoscope) to the sounds within the body, chiefly for ascertaining the condition of the lungs, the heart, and other organs. Discovered in 1814 in Paris by Laennec.
(3) Analysis of the patient's sputum.
(4) The X-ray--confirms the findings of percussion and auscultation, showing the changes of tuberculosis, of pneumonia, of fluid and pus in the chest. Discovered by Roentgen.

The Nervous System.

"Without this holy of holies of the human organism we should be senseless, sightless, soundless, motionless masses of multiplying protoplasm. Everything else about the body is vegetative. Which means like a plant. A plant can neither move, nor feel: its life processes are carried on in response to the most primitive chemical and physical changes in its immediate environment. The nervous system gives us every contact which we ever possess with the rest of the world; it responds to those contacts in terms of agreement or repulse. In some mysterious manner it furnishes us with every association, every pain, and every delight which we experience throughout our lives."
The neuron(e). Just as the anatomical and physiological unit of muscular tissue or connective tissue is either a muscle cell or a connective tissue cell, so the anatomical element of nervous tissue is the neurone. In a sentence it may be said that the entire nervous system is nothing more than an aggregation of these neurones. Structurally the neurone may be divided into three parts: (a) the nerve-cell proper; (b) the nerve-fibre or axon; and (c) the nerve endings. The function of the neurone is to receive and to transmit nerve messages or impulses. Because of the large variety of messages passed through each neurone, its nerve-cell (with its nucleus and cytoplasm) requires several branches, called dendrites, which intermesh

with the dendrites of other neurones, thus acting as synapses or links. To connect the nerve-cell proper with some region of the outer part of the body is the function of the nerve-fibre or axon, whose endings may end in different ways (e.g. motor plates, epithelial arborizations, various tactile corpuscles; special sense organs).

Neurones are divided into two great classes, viz., those in which the impulses travel along the nerve-fibre from the nerve cell to the nerve-endings--they are called efferent neurones; and, secondly, those in which the impulses travel in the reverse direction, called the afferent neurones. The most striking example of efferent neurones are those ending in muscle fibres, hence called motor. For similar reasons, afferent neurones are often spoken of as sensory. The speed at which an impulse travels along an afferent nerve-fibre is about 140 feet per second; the efferent impulses travel somewhat slower, namely about 110 feet per second. The nerve-fibre of each neurone is of microscopic thickness, but when a number of these nerve-fibres is bound together in a bundle, we get the plainly visible nerve-trunks or nerves, such as are seen in dissection of the body. They are whitish cords which arise from the cerebro-spinal axis, and, branching as they go, are distributed to all parts of the body, so that every organ and tissue has its supply of nerves, connecting it with the brain or the spinal cord. Because the nerve-cells proper are grey in colour, we hear of "grey" and "white matter", in every day talk.

The nerve-cells are not scattered promiscuously throughout the body; they gather in certain regions or groups. If the bony (dorsal) cavity which encloses the central nervous system were laid open from the skull to the tip of the spine, we could see that it is composed essentially of masses of nerve-cells, called ganglia, and of their connections. These ganglia are superimposed on each other, the more complex above, the less complex below. Above the spinal cord is the medulla oblongata, which, like the spinal cord, conducts impulses to the higher brain centres, and acts as a reflex centre. If the medulla is injured, the lungs and the heart are injured, and life ends. Not far from the medulla, at the back of the head, is the cerebellum, which controls muscular tension, giving us the power of co-ordination and also of the locomotion of the body. (Note: alcohol affects the cerebellum with obvious results). Above these portions of the brain is the cerebrum which comprises more than $\frac{3}{4}$ of the entire brain, and whose main functions are: (1) the seat of the mind or intelligence; and (2) the seat of the sensations, both special and general (special, like sight, sound, smell, touch, and taste; general, like joy, fatigue, nausea, hunger, thirst, pain, etc.)

Intimately connected with the cerebro-spinal nervous system is the sympathetic system, whose principal functions are to control the actions of the digestive organs, the kidneys, the blood vessels (their contraction and dilation), the vessels of the skin (e.g. sweat glands), and some special senses (e.g. the pupil of the eye) through reflexes or actions which do not involve the higher centres of the brain.

Certain drugs (including nicotine which is found in small doses in tobacco, have selective actions upon one or the other part of the sympathetic nervous system. Adrenalin, for instance, stimulates all of the sympathetic nervous system. Which brings us to the endocrine or ductless glands system.

Although the presence of certain masses of tissue scattered widely in the human body but not seeming to have any reason for being where they are, has been known from the time of the earliest anatomists, it is only recently that physiologists have learned to know something of what these structures, called the endocrine or ductless glands, do. Definite facts about these structures were learned first from their diseases in the late 18th and 19th

centuries. The entire system of endocrine glands consists of:
(1) the pineal gland--about ¼ inch long; located near the base of the brain. It attains its maximum growth at about the 7th year, and after puberty decreases in size. It is thought to control height and to restrict the reproductive functions until puberty.
(2) the pituitary--about the size of a small pea; hangs from the base of the brain, fitting into a solid, protective bony cup in the skull. It is thought to influence the activity/of the kidneys, also to tend to raise the blood pressure, slow the heart rate, and help to maintain muscular tone.
(3) the thyroid--a purplish mass of tissue well supplied with blood-vessels and located at the root of the neck. It is thought to influence the general rate of metabolism (cellular activity). An abnormal enlargement of this gland, known as goitre, is probably due to the lack of iodine in water and soil.
(4) the parathyroids--four tiny glands attached and placed to the sides of the thyroid gland. They are thought to regulate the assimilation of calcium, necessary for muscular tone and bone.
(5) the thymus--a large mass of whitish tissue in front of the trachea in the chest cavity; it is found in young people, but atrophies and almost disappears at the age of puberty. Its function is obscure, but its removal is known to retard growth.
(6) the adrenals--two small glands, one on top of each kidney, are essential to life. Their secretion (adrenin) stimulates and regulates the heart beat and tends to increase the blood supply to the muscles, the nervous system, and the heart.
(7) the islets of Langerhans--located in the pancreas, these "islands" are groups of cells seen only microscopically and concerned with carbohydrate metabolism. When they degenerate, diabetes results.
(8) the gonads--i.e. the ovaries in the female, and the testes (testicles) in the male; they pass a secretion into the blood which, working with other glands, regulates the secondary sexual characteristics or the physical differences between male and female, such as the difference in hair distribution (e.g. beards), and in the pitch of the voice.
These eight groups of glands are called the ductless glands because they elaborate secretions which are poured directly into the blood-stream.
Two general principles may be laid down about the ductless glands, viz:
(1) They form a connected system. They are interdependent. The secretion of one balances or supplements the secretion of another.
(2) In general they preside over four functions: (a) growth; (b) nutrition; (c) sex; and (d) the vegetative process of gland secretion and involuntary muscle control.

The Reproductory System.

In our definition of the human body we said that one of its main functions is "the reproduction of other individuals of the same species." Yet the reproductory system, as such, is not taught in our schools even in this enlightened era. Nor are the parents, as a rule, very anxious to discuss it with their children. But why not? There are a good many things that can properly be told the rising generation.

Fundamentally, the human male and human female differ in the organs of sex, and in those parts of the female specially adapted to child bearing--in short, the organs of reproduction. Other structural differences, however, are apparent, too: the female's bony framework, for instance, is more graceful and lighter than the male's, and her body more rounded owing to the layers of fat on the breasts and in the pelvic regions; besides, the

texture of her skin and hair is undeniably finer. Again, due to the greater width of the female pelvis, her thigh bones are set wider from the body, forming a greater angle from the hips down to the knees, which fact explains her "feminine walk" (i.e. swinging one leg around the other), and partly accounts for her lesser agility and adaptability in athletics. Finally, whereas the female sex organs are contained within the pelvic cavity (necessitating its greater width), the chief male sex organs--the penis and the testes, the latter enclosed in a sac of the skin called the scrotum--are suspended externally.

The testes are constantly producing male elements of generation, called spermatozoa or sperms, which are small cells consisting of a head and an incessantly moving tail which makes them automatically mobile. When matured, the sperms travel in the spermatic cord along the groin and are deposited in two small sacs at the base of the bladder, technically known as the seminal vesicles. Here they float in a fluid called semen, largely secreted by the prostate gland, also at the base of the bladder. The ducts from the seminal vesicles open into the urethra, a mucous-membrane-lined canal enclosed in the penis. Under sexual excitation a nerve stimulus is sent whereby the exit of the veins at the base of the penis is constricted, and since the arteries continue bringing blood to the organ at a greater rate than normally, the spaces in its spongy tissue become engorged, resulting in its enlargement and erection. If the excitation is great enough, ejaculation follows, the semen with the sperm being deposited in the female genital tract, where it fertilizes the female sex cell or ovum, providing one is present. The female organs of reproduction consist of the vagina, or birth canal; the uterus, or womb; the two Fallopian or uterine tubes which extend outward from each corner of the top of the uterus; and the two ovaries, situated below the Fallopian tubes. The ovaries, analogous to the testes, are not connected with the Fallopian tubes directly, but when an ovum develops, it comes to the surface of the ovary, and at maturity drops into the abdominal cavity, where it is immediately picked up by tentacle-like ends of the tube, and moves forward, propelled by small hairs on the cells of the lining of the Fallopian tube, until it reaches the uterus. Here it is either impregnated or cast off in the next menstrual period, menstruation consisting of the issuing of a mixture of blood and cellular debris, including an unfertilized ovum.

The mechanism of menstruation has been worked out as follows: at birth the two ovaries contain approximately 30,000 ova, no new ova being produced during a woman's lifetime; these are all in an immature state and are collected together below the surface of the ovary. One, however, matures every 28 days, and works its way up to the surface of the ovary, and thence to the uterus, where it rests for a few days. If impregnation by the male sperms occurs at this time, the ovum begins to develop and the state of pregnancy is initiated. If, on the other hand, impregnation does not occur, menstruation takes place, the unfertilized ovum is cast off, and the whole cycle is started afresh.

The active period of female sexual life lasts about thirty to thirty-five years. Then the menses begin to be irregular and scanty and finally cease. At this time, too, the ovaries atrophy and the uterus becomes smaller. This period is called the menopause, and the woman needs careful watching and tender care during it.

Pregnancy: As soon as impregnation of the ovum occurs and the development of a new individual within the uterus begins, profound changes are initiated all over the female body. The expectant mother now has to digest, absorb, nourish, and excrete for two. The heart, therefore, pumps a little harder. The liver and kidneys bear an extra burden of work. Metabolism is carried